DOCUMENT RESUME

ED 334 666 EA 023 145

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TITLE Redesigning Schools: Architecture and School Restructuring.
INSTITUTION American Federation of Teachers, Washington, DC. Center for Restructuring.
PUB DATE 91
NOTE 16p.
PUB TYPE Collected Works - Serials (022) -- Guides - Non-Classroom Use (055)
JOURNAL CIT Radius; v3 n1 Apr-May 1991

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cooperative Planning; Educational Cooperation; Educational Environment; *Educational Facilities Design; *Educational Facilities Improvement; *Educational Facilities Planning; Elementary Secondary Education; Flexible Facilities; Interior Space; Physical Environment; School Buildings; *School Restructuring; School Space; Space Utilization; Student School Relationship

ABSTRACT

School architecture should be redesigned to match the vision for overall school restructuring. After explaining the need for improving educational facilities, this document describes the role of environmental variables in motivating and assessing improved student performance. The relationships between the environment and social attitudes and between the environment and future demographic, safety, and health concerns are mentioned and restructuring is defined as both product and process. Next, the conventional design process, in which the architect is the primary designer, is compared with the collaborative design process that involves educators, administrators, and community members in the building design. The "interactive environment," "learning community," and "activity appropriate environment" are described as constructs that need architectural expression. Three successful collaborative design projects are described: (1) The design of the Saturn School in St. Paul, Minnesota; (2) the physical redesigning of Hammond Public Schools in Indiana; and (3) the Saturn Project in Florida that led to the construction of 49 new schools. Last, questions regarding the process, design, implementation, and evaluation of school construction that fits restructuring visions are addressed. Included are 13 contacts for information on redesigning schools and 3 pictorial examples of school architectural precedents. (20 references) (CLA)

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Radius

A Publication of
The AFT Center For Restructuring
Directed by the AFT Educational Issues Department

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U.S. DEPARTMENT OF EDUCATION
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Vol. 3, No. 1 **April/May 1991**

Redesigning Schools: Architecture and Restructuring

Editor's Note:

In a now famous quotation, Winston Churchill remarked that "We build buildings, and then they build us." In this issue of *Radius* we examine the subtle yet forceful interplay between the educational visions inherent in the restructuring of schools and the physical spaces in which these visions are being realized.

The topic is a timely one. Over half of existing school facilities were constructed in the 1960's. Their projected life is thirty-five years. The typical rural school is even older and more frail, having been built around 1946. And as for those schools built for durability, such as the granite behemoths in our inner cities, the peculiarly modern demands of health, technology, energy and safety have combined to render them almost hopelessely obsolete.

Of course, creating new buildings and retrofitting old ones can be costly. One estimate places the amount necessary at $84 billion. Yet, perhaps surprisingly, last year a staggering $10 billion was spent on school facilities. Will the expenditures help reverse the dismal state of American education? Accept the poignant sense of urgency, and the question is not *whether* we need to reverse it; it is *how* to.

What kinds of facilities should we be creating? What should the role of educators and others be in this massive undertaking? How can design enhance student performance? These are pressing questions, indeed. For if Churchill's trenchant observation is at all correct, this generation of future citizens and workers is being built by an already vanished past.

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Introduction

Last year, when Mike Hopkins discussed computer-based learning projects with his fifth grade class, he did so in a very low-tech environment – the hallway floor outside his classroom. That was because inside the classroom the students engaged in this particular project were sandwiched betweeen two other groups of students working on the stationary equipment jutting out from the walls of the room. That left only the center of the room in which to locate the computer-based learning project. "We had to leave the class, go out in the hallway and sit down. When classes changed, students would be climbing their way through us, but the hallway was the only place I was able to communicate with these kids without completely disrupting the other two groups working inside the room."

Mike Hopkins doesn't have that problem anymore. As Lead Teacher in St. Paul, Minnesota's Saturn School, he and his colleagues have designed an environment made to accommodate their vision of what schooling and learning is all about (see below).

Unfortunately, most teachers do not have that luxury. For them, classroom innovations involving technology or cooperative learning remain anchored to physical structures designed for a different time; a time in which teachers were expected to do all the talking and children all the listening. This was (and still largely is) the self-contained classroom within the "eggcrate carton" school.

But does changing the school environment have any appreciable effect on student learning and achievement? What does the research say? And if it does matter, is there a best way to go about designing new environments? Are there examples and lessons worth looking at? These are some of the questions we examine in what follows.

Changing the Physical Environment: Why Bother?

Determining the environment's effect on learning is nothing if not complicated. Where does the "environment" end and "learning" begin? How tightly can the boundaries be drawn?

Not very, according to many researchers. For the causal connection between the two depends in no small measure on how each is operationally defined. At present, these operational definitions are sources of great controversy.

Take "student achievement." If equated with standardized multiple choice tests, the environment/learning connection appears weak indeed. The litany of physical variables – seating position; classroom design and furniture arrangement; density and crowding; privacy; noise; windowless classrooms; school building age; thermal factors – none enjoy an uncontested correlation with higher test scores.

But why should they? Most standardized tests require only that a severely restricted repertoire of skills be employed in an artificial environment and over a limited period of time. Filling in the bubbles on multiple choice answer sheets, for example, suggests the environment be neutralized, not utilized. The result? A dubious artificiality, for unlike most out-of-school experiences, standardized multiple choice tests dictate that students labor alone at desks in eerily noiseless rooms.

Not surprisingly, this is one reason why multiple choice tests have come under such intense fire of late: They fail to tell us much of what we really want to know. We want to discover what students are able to *do* as well as what they might happen to *know* (or not know). But for that we need novel types of assessments, assessments that place students in real-life (or simulated) situations and environments. It is this desire that fuels

the call for "authentic" or "performance-based" assessments.

Radically different measures of student achievement could spawn an unintended consequence. They might indicate that environmental variables are instrumental in *motivating* improved performance as well as in *assessing* it. If, for example, manipulatives are understood to be critical in assessing how well students are able to learn and demonstrate certain mathematical concepts, it seems likely that the classroom design in which the manipulatives are utilized could have a direct bearing on how well the tasks can be performed. The same could be said of "hands-on" science or other subjects inviting students to maximize the use of their environment in demonstrating what it is that they know and can do. This is also true for eliciting shared work. There is simply no more sensible way to go about assessing how well students can work together in teams than providing sufficient space for cooperative learning and teamwork to occur.

A more robust conception of student achievement, therefore, entails the need to redesign learning environments. Unfortunately, in accepting the prevailing conceptions of achievement, researchers have also accepted its dominant physical paradigm—the self-contained classroom. In fairness, this is because there is little else to do research *within*. Inevitably, variables like privacy, noise, and furniture arrangement become cemented within the ubiquitous context of the "eggcrate carton" school.

Suppose, however, the model were different. Instead of students working alone at desks in sterile classrooms, suppose the schools allowed for multiple spaces in which various kinds of learning or "intelligences" (to borrow Howard Gardner's phrase) could flourish. Unlike traditional classrooms (or the "open classrooms" and "pod" schools of the 1970's), these spaces or work areas might accommodate different groupings and different functions. Some might be designed and furnished to promote quiet reflection or small group interaction. Others might be constructed to reflect in microcosm the world of health professionals, performing artists, or engineers. All would be flexible; versatility, their essence.

Clearly, unlike traditional classrooms, such environments would, in the hands of capable practitioners, promote the active learning and achievement suggested above. Because research has been concentrated within traditional school models, however, a potentially richer vein of inquiry has gone unmined. The link between environment and learning remains confusing.

The environment and social attitudes: Despite the many difficulties linking environment to learning, it should be said that physical structures *do* affect social environments for learning. This much the research corroborates, according to James Banning, a Colorado State University psychologist familiar with the literature. High density, for example, issues in pupil dissatisfaction, decreased social interaction, and heightened aggressiveness. Conversely, classrooms created with special attention to seemingly minor environmental characteristics ("soft" classrooms, one researcher labels them), lead to improved student interaction with materials, decreased interruptions, more substantive questioning and the like (Banning, 1990).[1]

The environment and future needs: Student achievement, though by far the most important, is not the only reason for educators to become involved in school design. Some others:

1) **Demographic:** The "baby boomlet" is here. Many states (especially those in the south and west) are undergoing dramatic surges in their student populations—the offspring of the baby boomers of the 1950's and 1960's and the influx of newly arrived immigrants. New schools or increased class

size? This is the resulting dilemma of the public policy debate that pits budgetary against educational priorities. Adding fuel to the debate is a twenty year trend expanding the amount of square footage allotted per student. "In 1970," according to Paul Abrahamson, Editorial Director of *American School & University Magazine*, "we were providing 62 square feet per student in elementary schools and 120 for a high school student. In 1990, we were looking at 96 square feet per student in elementary schools and 160 in high schools."[2]

Nor is this the only demographic strain on schools. With more single parents and working couples, the demand for preschool, after-school, and general day care is rising. So is the demand for support services to students and for continuing education and training, athletic facilities, and meeting centers for the wider community. Designing schools that meet the diverse needs of many different populations while functioning primarily as learning environments for children is a challenge educators need to address.

2) **Safety**: Over the past decade many school districts have taken measures to insure the safety of their staff and student populations. While these measures (such as the installation of metal detectors) deterred crime, they also exacted a price: "the sense of a relaxed setting, intended to encourage learning, often was lost."[3] Educators, particularly those in crime-ridden areas, will have to puzzle over how best to design environments that personalize learning spaces while not endangering students and staff.

3) **Health**: Indoor pollution is a major health hazard. Problems caused by asbestos, radon, pesticides, and lead in the drinking water seriously affect development in school age children; and the imperative to cure "sick" buildings of toxic by-products of carpeting, bacteria from air conditioning and the like is a pressing one.

Restructuring: A Time for Collaboration

"State legislatures, regulatory agencies, and product manufacturers have had more effect on school design and equipment than educators."[4]
Harold Hawkins, The Interface Project, Texas A&M University.

In what is surely an instance of unwanted serendipity, the moment seems ripe for educators to assume partnership in school design. For the combination of a corrosive infrastructure, dangerously lacklustre student performance, and radically shifting demographics coalesce into one giant question mark: If not now, when? It is time to blend design questions into the collaborative process of restructuring schools.

Restructuring, however, is both process and product. Unless dramatic improvements are made in student performance, we risk our collective economic and political future. In that sense, restructuring is "product" or results-oriented. Asking students to demonstrate what they know and can do and establishing standards of performance are key components of this "product." This, in turn, requires new ways to assess and motivate active learning. It also requires that we become critically aware of the constraints and possibilities inherent in the physical environment of schools.

Restructuring is equally "process." Not only does it take time (a great deal of time), it also takes the commitment of many people working together to achieve a common purpose. Unfortunately, as the quotation beginning this section points out, educators have ordinarily been excluded from the process to redesign schools. Even the advent of school-based management and shared decision-making has made little difference. Schools get designed pretty much the way they always have—by architects, the district planning office's red

pencil, and scant attention to educational needs and philosophy.

Exceptions do exist. At both the school and district level there are now underway some noteworthy attempts to involve key players (teachers, paraprofessionals, parents, students, and others) in the design process. To put the exceptions in perspective, it is helpful to compare the older conventional process with one more sensitive to the restructuring agenda.

The Conventional Process

The first step in the conventional design process is to prepare a program of requirements that defines the types of spaces, their sizes and their relationships. This statement might be prepared by an architect or a specialized school programming consultant, who develops information through the interview process by separately querying representatives of every interest group. The information is then independently collated into a program that reflects these requirements.

If it is appropriate to reuse an existing school, the architects will first conduct a feasibility study to determine the potential fit between the program requirements and the existing structure.

The architect then prepares concept drawings, again working independently, that translate the written program into a physical design. The design is then presented to school representatives for their approval. Normally, the community is not part of this review or approval process.

Once a conceptual design approach is agreed on, the architects then develop the design through a number of stages that incorporate increasing detail. Finally, contract documents (working drawings and specifications) are prepared. These describe the design in detail so that a contractor can determine a final construction cost and finally begin to build the school.

The Collaborative Process

The collaborative approach in school design differs in many respects from the conventional approach. In a collaborative process, educators, administrators and representatives of the community (and, in some cases, students) meet to jointly formulate a plan for restructuring the school to meet students' and clients' needs. (It is important to determine a workable size for the team. The complexity of arriving at a consensus is usually in direct proportion to the size of the design-making group.)

Based on the resulting plan, the team meets with the architects and/or planning consultants to define the key issues for building design raised by the plan. Alternative responses to each issue are examined to determine which approach best fulfills the objectives of the plan. Selected responses in combination constitute a program of design intentions.

As with the conventional process, if reuse of an existing school is under consideration, a feasibility study would be undertaken to evaluate the accommodation of the existing structure to the program. Renovation costs are developed and compared to the costs of building from scratch.

Next, while working with the team, the architects develop a series of design alternatives that reflect a different prioritization of the responses. The ideal form for developing alternatives is the workshop, with the team and architects working hand-in-hand to facilitate the clear communication of ideas. Working this way allows the team to comprehend fully the design decision-making process and the implication of each decision. Conversely, the architects will also better understand the objectives of the team. Each alternative is then compared to the program of requirements and, depending on the fit of each, one

design approach is selected. The design process is by its nature iterative, which means that the program is constantly adjusted and developed.

The architects then prepare a detailed final design alternative and review it with the team. At this point, a cost estimate is developed to insure the design is within budget.

In the collaborative approach, the architects support the evolving design of the school through phases of ever-increasing detail. Unlike architects working in the conventional manner, they meet with team members on a regular basis, thus making sure that all details, down to door knobs, meet the needs of the restructuring plan.

Enter Restructuring

The collaborative process is not news. It has existed in one form or another for at least thirty years. What makes it news is the attempt to integrate it with some key educational ideas on the restructuring agenda. It is also what sets apart the design of restructured facilities from architectural responses of the past.

Schooling has been dominated by three architectural models: The "eggcrate" school (double loaded corridors leading to isolated classrooms); the "pod" school (a cluster of classrooms organized around a teaching unit); and the "open" school (undifferentiated flexible space). (See illustration, p.6-A) Each construct contains an appropriate educational philosophy to justify the way it organizes space. But the three fall short, according to Susan Stuebing, senior architecture researcher at the New Jersey Intitute of Technology, in capturing the radically new threads of educational thought.

Stuebing suggests three constructs overlooked by the traditional models: (1) the interactive environment, (2) the learning community, and (3) the activity appropriate environment. Only recently has their need for architectural expression become evident.

The "interactive environment" is perhaps best illustrated by the model of the children's museum. Here students are workers, learning takes place through inquiry, and the environment supports the diversity of students' learning styles, intelligences, and talents. It is the kind of environment appropriate to performance-based assessments.

"Schools," however, need not be "buildings." The concept of a "learning community" blurs the boundary between learning in school and learning out of school. Restructured schools are designed with this fuzzy boundary in mind. Community service, the home learning environment, apprentice programs—all have architectural implications for restructured schools.

The third construct suggested by Stuebing is what she terms "activity appropriate environments." These are environments built with an eye to pedagogical models like cooperative learning and peer tutoring. But spatial configurations hospitable to this more encompassing pedagogy are rare. So, too, are professional work spaces where groups of teachers can discuss strategies and share resources.

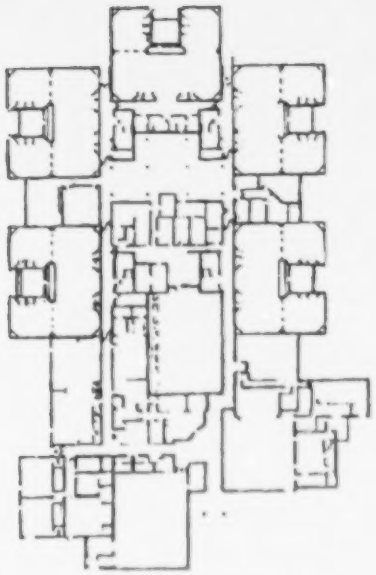
Each construct lacks an appropriate architectural response. Until recently, that is. For educators are just now realizing that a collaborative process coupled with a more dynamic vision of education can be very powerful indeed.

The Saturn School

The creation of the new Saturn School, a restructured middle school in St. Paul, Minnesota, demonstrates how the primacy of contemporary educational concerns can be

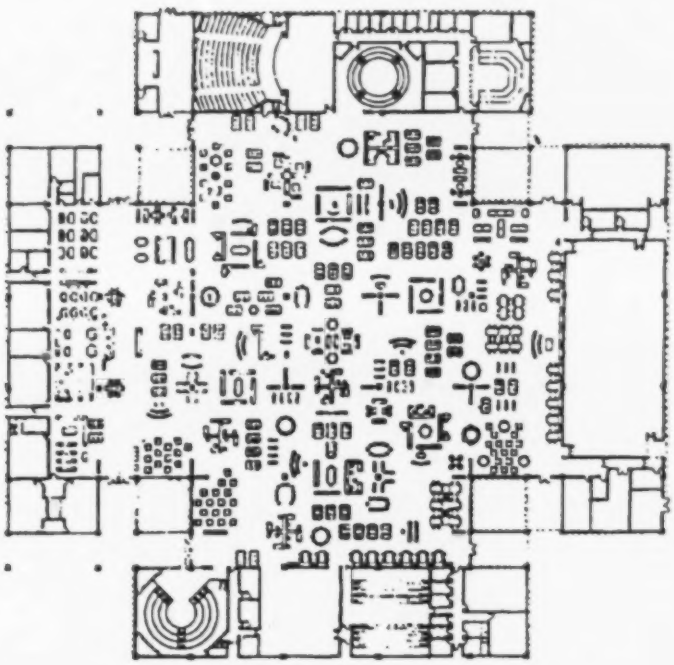
1

New Elementary School
Mount Laurel, NJ
The Tarquini Organization,
Architects



2

Bollman Bridge Elementary
School
Howard County, MD
Grimm and Parker,
Architects



3

Juanita High School
Juanita Beach, WA
Kirk, Wallace and McKinley,
Architects

Examples of Architectural Precedents

(1) The Classroom School
(2) The Pod School and
(3) The Open School.

Reprinted from "Design Notebook Studies", Architecture snd Building Science, New Jersey Institute of Technology

fostered through collaboration. Initiated by the school board, parents and staff (in response to a challenge issued by AFT President Albert Shanker), Saturn was born of the desire for a school where students would be active learners, and where individual attention to their needs (a personalized learning plan for each youngster) could be accommodated through intensive use of technology. Its creation was supported by the efforts of many different institutions including the St. Paul Federation of Teachers, the University of St. Thomas, and the Minnesota Educational Computing Corporation (MECC).

Cramped initially in two rooms of a building designed for handicapped children, Saturn's early life was hammered out against the harsh constraints of a more traditional school space. The limitations of an old building, however, enabled the staff to better fashion a new one. Only gradually did the outlines of what they wished to accomplish become clear. Language itself assumed new importance: The faculty would be staffed by a lead teacher and three "associates." "Classrooms" would be replaced with "workrooms" and "learning spaces."

Parents, too, were involved. They were encouraged to help find a location for the new site. A task force formed and potential candidates scrutinized for an eventual downtown location. With all but four eliminated, the task force and Board finally settled on an unused YWCA building. By then, the faculty had agreed on the general philosophy of the new school.

Ideas had come from many sources. As the result of a course put together by an associate teacher, students helped think through the relation of curriculum and school design. Teachers redesigned their roles as well as their workspaces. No teacher was to be assigned a particular room. Instead, the rooms were to serve various functions.

Computer and video networks were to run throughout the building. They would help connect the school to the world outside. Technology was not to be the only connection, however. Located downtown, students could take courses and programs at neighboring cultural institutions.

New furniture and technologies would match the purposes for which the spaces were intended. Gone were the old student desks, replaced by work benches, soft modular furniture, and uniquely accessible and unobtrusive work stations for computers, monitors, and keyboards.

An architect was hired and the painstaking work began. The architect, lead teacher and three associates met often, usually two or three times a week. They agonized over the uneasy fit between budget and vision. A technology consultant designed the computer and video network. The architect returned with "living drawings" that were changed and changed again to reflect staff and parent input.

By January, 1991, the new site was operational. Approximately 220 students, grades 4-7, now share the remodeled five-story facility with one lead teacher, three associate teachers, five generalist teachers, and four student interns. The first floor is composed of a reception area, a large auditorium stage with a video production area attached to it, and conference rooms. Technology labs occupy the second floor – integrated learning systems, an Apple II lab, a MacIntosh writing lab, and a "discourse" room which allows students to respond via computer to teachers' questions. Cooperative learning areas and an electronic library dominate the third, while the fourth floor is composed of work stations and learning spaces – two writing labs, a music room, science lab, and a multipurpose project room. A fifth floor houses staff office space. All in all, Saturn resembles a modern office more than it does a school.

In retrospect, there is little that Mike Hopkins, Saturn's lead teacher, would have done differently. Perhaps more planning time and site visits to schools that had been through the process would have been useful. "And we could've had more exposure to what was on the technological horizon; it's no simple matter planning a system in which the information flow to and from all the learning areas is built in." But all things considered, the collaborative process worked well for the Saturn School. "We shared a common vision," Hopkins says. "Everything else flowed from that."

Hammond Public Schools

The collaborative design process need not be restricted to the creation of a single school. In Hammond, Indiana, the school district is collaborating on the physical redesign of all its schools. "It began with a facilities study," according to Bob Flach, Hammond's Assistant Superintendent in charge of Business. "I had noticed that our maintenance costs were way out of line with the national average, and when I did a little digging, the reason seemed clear: Our facilities were outmoded. Teachers were teaching in horrible conditions."

A one year in-depth study resulted. It concluded that something dramatic had to occur. It soon did. Shared decision-making and school-based management were folded into a plan to reshape every school in the district. Eighteen elementaries would be reduced to twelve; four high schools would become two. But the fewer number of facilities would reflect far more efficiently the effective use of space.

Hammond's collaborative process is divided between two sets of teams—a central design team and individual building design teams. The central design team (teachers, administrators, support staff, and community members) spells out the boundaries for the project: statutory requirements, financial parameters and so on. Budgetary ceilings were temporarily put aside to stimulate building level imaginativeness. Most importantly, the team drafted an overall vision statement to guide the effort. "In effect," they concluded, "we are faced with the twofold challenge of: 1) how best to prepare our children for a future which is unknown to us, and 2) how to plan a learning environment for them which will, in fact, need to support instructional strategies and approaches unlike any with which we are presently familiar."

The building teams are left free to establish specific educational means that satisfy the district's philosophy. With three elementary schools leading the first phase of the project, facilitators are helping each building team reach consensus on how best to incorporate learning and teaching priorities in their building plan. The core design team includes parents along with respresentatives of the different grades, subject matters and support personnel. Yet the precise team composition often varies depending on the topic under discussion at the time. That way, although everyone is permitted to participate, those who are most affected actually do.

Although still early into the process, lessons are already emerging. Understandably, the amount of time required to accomplish this ambitious an agenda is extraordinary. Release time costs alone are considerable. Bob Flach, however, is unfazed. "When compared with the $3-5 million we were wasting on inefficient buildings, worrying over the cost of release time doesn't make sense."

A second, more cautionary, lesson is expressed by Pat O'Rourke, Hammond Teachers Federation President: "It would have been suicidal for us to have begun this project without the supporting environment created by the union, administration, school board, and community. We were already believers in shared decision-making; no one had to convince us of either its value or the amount of training it requires to be done right. I would be hesitant

to recommend other districts try what we're doing unless the sense of partnership among all the parties had been nurtured and developed over a long period of time."

The Saturn Project: Dade County

The flavor of partnership pervades a similar effort in Dade County, Florida. Having secured passage of a $980 million bond issue, the union, administration and board decided to utilize their school-based management/shared decision-making project to build a total of 49 new schools.

The Saturn Project (not to be confused with St. Paul's Saturn School) is intended to borrow from the private sector practice of planning and designing new facilities around the work to be done and, like Hammond, to involve the persons who will do the work. A full year before the doors open in a new facility, teacher and principal teams are already busily employed deliberating issues of design, equipment and technology. But, according to Frank Petruzielo, Dade's Associate Superintendent of Professionalization, "Even this time frame is already too late for the users to significantly influence many key design decisions. The process should really begin even earlier."

Some Important Questions

Experience suggests a number of questions prospective design teams should address as they go about the collaborative process of restructuring their learning environment. While by no means exhaustive, the following is meant to help think through some of them.

Process

1) *What groups will be represented on the collaborative design-making team?* The design team should not only reflect broad representative participation, but should also aid the work of any school-based management team. Since the two kinds of teams so easily overlap, consideration might be given to incorporating the design team within an on-going shared decision-making group.

2) *How large should the decision-making team be?* This depends on the type and size of the school being planned. Large groups can be organized into sub-groups that take responsibility for specific areas of concern or interest. But the larger the group the more difficult it is to resolve opinion on needs and priorities, leading to an increase in the planning and design time.

3) *How should the design team interact with the architect?* All too prevalent is the "reactive" mode where school representatives assume an advisory role and react to the design proposals made by their architects. The preferable posture is a collaborative or "proactive" one in which school representatives assume an equal role with the architects in evolving a design approach. This calls for full confidence between all parties and an ability to communicate information clearly and effectively.

Design

1) *How can different learning activities be accommodated during different times?* The traditional approach is to plan specific spaces for specific activities. This is costly and inefficient. General purpose spaces of varying sizes and locations should be considered to accommodate a range of different activities. This versatility, however, should be rooted in a philosophy that maximizes an active, hands-on and cooperative approach to learning and teaching.

2) *How can the need for changes in requirements for new technologies and spatial layouts best be accommodated?* On one extreme the design can be planned for full flexibility of spatial layout and mechanical and electrical equipment. This approach was tried in a number of schools in the 1960's and it was found to be costly and

rarely utilized. A more moderate approach is to make special provisions in only the electrical and mechanical systems, since changing placement of walls of standard construction is a relatively simple and inexpensive procedure.

3) *To what degree will new technologies be incorporated into the curriculum?* New technologies require complex electrical transmission systems. Such facilities can be planned for (in varying degrees) at the outset by making provisions in the building infrastructure that permit the initial system to be expanded and changed over time as new technologies are developed.

4) *How can the expansion of a school facility be best achieved?* The school might be planned in such a way that new additions are easily added by making site access available for future use. Another approach is to plan for an optimum size of school and build an entirely new facility when growth in student population needs to be accommodated. It is also possible to conceive of expansion outside of the school building proper. Design ideas connecting school to the "outside" world should be explored.

5) *What strategy should be pursued for deciding whether to build a new school or modernize and expand an existing one?* Building a new facility allows for all the requirements to be fully accommodated but usually costs more money. Adapting an existing building usually calls for compromise because of the necessity to work within an existing structure but it usually leads to cost savings. It also requires alternative accommodations for the school during the construction period. In either case the process should begin at least a full year before the first nail is hammered.

6) *How should the school be physically organized?* The response to this issue depends on the philosophy of the school program. The traditional approach is to organize all classrooms and related activities so that each classroom is self-contained yet an active part of the total space of the school. Normally, in this scheme, classes are organized horizontally or according to grade. An emerging trend, however, is the vertical organization in which a limited number of students are organized into sub-schools, houses, or charters within the entire school organization. This approach, which is most common in large secondary schools, has the advantage of breaking down the scale of the school into more manageable and intimate learning environments. The creation of non-graded or multi-graded elementary schools also invites design ideas that reconfigure spatial arrangements.

7) *What type of community activities should be accommodated?* A community-based school should include activities that bring the community into closer contact with the school. The functions can be wide-ranging, including meeting rooms, athletics and adult education classes, social service agencies and day care facilities.

8) *What should be the character of the exterior of the school?* This is an area traditionally left to the architect, although there is no reason that the design team should be excluded. A variety of solutions exist – from a "background" approach in which the building takes an expressive form related to the physical character of the surrounding neighborhood, to a "foreground" approach whereby the appearance of the building is distinctive and stands out from the surrounding buildings as a symbol of its special importance within the community.

9) *What approach should be taken in designing a series of schools?* To save money and time during the design process, it is appealing to consider a "prototype" design that can be repeated in any number of sites. But while cost effective, this approach compromises the belief that each school should be designed to meet the needs of a specific community and educational philosophy.

Implementation

What organizational approach should be taken to constructing a school? There are two general approaches utilized in school construction. The first is the traditional approach in which a general contractor is selected based on a public bidding process. The general contractor hires and coordinates a sub-contractor for each of the building trades. In a tight economy, this approach can lead to considerable cost savings due to the competitive nature of the bidding process. The second approach is to hire a construction manager who acts as agent to the school board. The construction manager is responsible for hiring subcontractors for each trade and insuring that the pre-determined "guaranteed maximum price" (G.M.P.) and time schedule are met. The price for these assurances is an additional fee that is paid to the construction manager. Both approaches should be considered and evaluated according to the particular situation.

Evaluation

Should post-occupancy evaluation procedures be instituted? There is no substitute for learning from one's mistakes as well as successes. To learn what works and doesn't, an ongoing evaluation procedure should be considered. The post occupancy evaluation might be conducted periodically (every five years, for example), prior to the planning of a new facility or making significant modifications in the old one.

A Final Note

Nothing in the foregoing is meant to imply that artfully crafted spaces or nifty new technologies are answers to the problems of American education. On the contrary. We have been careful to point out that it is *people* – their vision, commitment, and ability to work together – that alone can get the job done. If structures are important (and they are) it is because they become tools in the hands of a culture that values and knows how to use them.

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Endnotes

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[3] *New York Times*, March 6, 1991.

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Radius is a bimonthly publication of the AFT Center for Restructuring.
The views expressed are not necessarily official AFT policy
but are intended to promote further thought and discussion.

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